TODOR I. TODOROV

Work: Crustal Geophysics and Geochemistry
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EDUCATION

University of Michigan, Ann Arbor, MI
Ph.D., Analytical Chemistry (December 2002)
Thesis: Capillary electrophoresis and migration dynamics of RNA
Advisor: Michael D. Morris

SUNY at Buffalo, Buffalo, NY
B.S., Chemistry, June 1998
Research Advisor: Luis A. Colon

EXPERIENCE

2006-present, Research Chemist, Crustal Geophysics and Geochemistry Science Center, US geological Survey, Denver, CO, GS-1320-13/5

- Novel methodology for the extraction and quantification (HPLC-ICP-MS) of Cr(VI) in soil and environmental samples
- Quantification of toxic elements in lung tissues by LA-ICP-MS in collaboration with National Jewish Hospital and Vanderbilt University
- Integrated a laser ablation ICP-MS system with a Raman microscope for simultaneous elemental and molecular characterization for biological, geological and pharmaceutical chemical characterization
- Developed multi-element isotope dilution methodology for the analysis and certification of reference materials
- Designed and characterized cryogenic laser ablation cells and developed methodology for elemental distribution quantification in biological and medical samples
- Analysis of major and minor constituents of pipe scales in support of EPA environmental monitoring by solution and laser ablation ICP-OES
- Provides technical expertise, research development and chemical analysis of radionuclides in support for the VA and DoD depleted uranium programs
- Developed methods and analyzed thousands of water, soil, sediment, rock and coal ash samples using total decomposition followed by ICP-OES measurements in support of various Mineral assessment programs
- Responsible for the operation, maintenance and training of personnel for single collector high resolution ICP-MS (Thermo Element1 and Thermo Element XR), ICP-OES (PerkinElmer Optima5300DV), fluid inclusion laser ablation ICP-MS systems (Coherent Geolas, Thermo XSeriesII) and cryogenic laser ablation ICP-MS systems (Geolas and NewWave UP platforms)

- Quantitative metal analysis in melt and fluid inclusions by LA-ICP-MS in support of Denver Inclusion Analysis Laboratory and the US National Mineral Assessment

2003-2006, Research Chemist and Laboratory Manager, Armed Forces Institute of Pathology, Washington, DC, GS-1320-12/9

- Developed methods for arsenic metabolite separation in tissues using liquid chromatography with ICP-MS detection
- Analyzed manganese and calcium distributions in bone by laser ablation ICP-MS
- Laboratory management duties in GLP environment (toxicology testing laboratory) including instrument maintenance
- Developed and optimized methods for ultra-trace elemental analysis (arsenic, selenium, cadmium, zinc, iron, tungsten, lead and mercury) by HR-ICP-MS, DRC-ICP-MS, GFAA and ICP-OES for clinical environmental and forensic samples
- In charge of all training of personnel, visiting scientists, post-doctoral fellows and summer students in trace metal analysis and vibrational spectroscopy
- Provided support to DoD and VA Depleted uranium programs by developing state of art methodology for the quantification and identification, analysis and data review of depleted uranium measurement in biological samples
- Supervised four technicians, two postdoctoral fellow and several summer students
- Quality control and assurance officer
- Documented and organized accreditation for College of American Pathologists and laboratory proficiency testing for toxic metals
- Participated as Co-I in three research proposals

2003, Postdoctoral fellow, Armed Forces Institute of Pathology Washington, DC

- Developed methodology for arsenic metabolite separation via liquid and ion chromatography with ICP-MS detection for blood samples
- Developed a laboratory electronic database for the Depleted Uranium Registry
- Participated as a Co-PI for Analytical support center proposal for MIL-CAM to Samueli Institute for Information Biology (favorably reviewed, funding starting date 12/2003)
- Laboratory management duties in a GLP environment
- Developed methods for the analysis of manganese and uranium in urine using ICP-OES, ICP-MS and GFAA
- Raman spectroscopy of cyanide interactions with cell culture media components
- Quality control and quality assurance duties for pathological cases analysis

1998 – 2002, Research Assistant, University of Michigan, Ann Arbor, MI

- Analyzed biopolymer (RNA/DNA) migration during capillary electrophoresis (CE) using UV or fluorescence induced detection
- Measured zeta potentials of micro- and nano-spheres using video microscopy and capillary electrophoresis (collaboration with Bristol Myers-Squib Medical Imaging)
- Visualized and investigated the motion of single RNA/DNA molecules undergoing electrophoresis by fluorescent video microscopy and image analysis
- Characterized the properties of sieving polymers for CE in the presence of urea

- Developed LabView controlled user/instrument programs for CE
- Raman spectroscopy of polymer buffer solutions used for CE of nucleic acids
- RNA/DNA image analysis using AutoVis/Autodeblur and Matlab software
- Performed multivariate analysis of Raman spectroscopy data using Matlab

1998 – 2000, Graduate Student Instructor, University of Michigan, Ann Arbor, MI

- Coordinated laboratory materials and instrumentation (HPLC, GC, GC-MS)
- Conducted lab sessions and graded lab reports for General Chemistry and Advanced Analytical and Physical Chemistry classes

1996 – 1998, Undergraduate Research Assistant, SUNY at Buffalo, Buffalo, NY

- Developed and prepared sol-gel coated columns for capillary electrochromatography
- Investigated coating properties (zeta potential and surface charge) using CE

SKILLS

High performance liquid chromatography
Ion chromatoraphy
Liquid chromatography ICP-MS
Inductively coupled plasma mass spectrometry (CCT, DRC and high resolution)
Capillary Electrophoresis
Laser Ablation ICP-MS
Fluorescence video microscopy
Raman Spectroscopy
Graphite furnace atomic absorption
Inductively coupled plasma optical emission spectroscopy
Capillary Electrochromatography
Multivariate statistical analysis
Quality control and quality assurance
Laboratory management
MS-Windows
LabVIEW
AutoDeblur
AutoVis

AWARDS

4/2011 – USGS Star award
11/2009 – USGS You make a difference award
6/2002 – HPLC 2002 student fellowship
10/2001 – Frederick conference on capillary electrophoresis 2001 travel award, sponsored by Pfizer, Procter & Gamble, CASSS and CSSC
1/2001 – HPCE 2001 travel award
5/1998 – Award for academic excellence, SUNY at Buffalo.
1997-1998 – Who's who in American Universities, SUNY at Buffalo
1997 – Golden Key National Society, SUNY at Buffalo

AFFILIATIONS

American Chemical Society, Member
Society for Applied Spectroscopy, Member
International Medical Geology Association, Member

PUBLICATIONS

1. Hofstra AH, **Todorov TI**, Mercer CN, Adams DT, Marsh EE, Silicate melt inclusion evidence for extreme pre-eruptive enrichment and post-eruptive depletion of lithium in silicic volcanic rocks of the western United States – implication for the origin of lithium-rich brines, submitted to *Economic Geology*.
2. Nanayakkara PWB, Centeno JA, Murakata LA, **Todorov TI**, Kanhai R, vanDiest PJ, Kramer MHH, Katzin WE, A case of silicone and sarcoid granulomas in a patient with "highly cohesive" silicone breast implants: a histopathologic and laser raman microprobe analysis, submitted to *European Journal of Internal Medicine.*
3. Hofstra AH, Marsh EE, **Todorov TI**, Emsbo P, Fluid inclusion evidence for a genetic link between simple antimony veins and giant silver veins in the Coeur d'Alene mining district, ID & MT, U.S.A., *Geofluids*, in press.
4. **Todorov TI**, Ejnik JW, Guandalini G, Xu H, Hoover D, Anderson L, Squibb K, McDiarmid MA, Centeno JA, Uranium quantification in semen by inductively coupled plasma mass spectrometry, *Journal of Trace Elements in Medicine and Biology,* 2013, 27(1), 2-6.
5. Patlolla AK, **Todorov TI**, Tchounwou PB, vanderVoet G, Centeno JA, Arsenic-induced biochemical and genotoxic effects and distribution in tissues of Sprague-Dawley rats, *Michrochemical Journal*, 2012, 105, 101-107.
6. Centeno JA, **Todorov TI**, van der Voet GB, Metal Toxicology in Clinical, Forensic and Chemical Pathology in *The Applicability of Analytical Techniques to Clinical Studies,* Eds. Caroli S, Zaray G., Chapter 6, John Wiley, New Jersey, 2012.
7. Church SE, San Juan CA, Fey DL, Schmidt TS, Klein TL, DeWitt EH, Wanty RB, Verplanck PL, Mitchell KA, Adams MG, Choate LM, **Todorov TI**, Rockwell BW, McEachron L, Anthony MW, Geospatial database for regional environmental assessment of central Colorado, *USGS Data Series 614*, 84p., 2012.
8. Chesnik I, Centeno JA, **Todorov TI**, Koenig AE, Potter K, Spatial mapping of mineralization with manganese enhanced magnetic resonance imaging, *Bone*, 2011, 48(5), 1194-1205.
9. Sarafanov AJ, **Todorov TI**, Centeno JA, Macias V, Gao W, Liang WM, Beam C, Gray MA, Kajdacsy-Balla A, Prostate Cancer Outcome and Tissue Levels of Metal Ions, *Prostate*, 2011, 71(11), 1231-1238.
10. John A. Ives, John R. Moffett, Peethambaran Arun, Jed Hartings, Ayo Olufade, Anthony Williams, Frank Tortella, **Todor I Todorov**, José A. Centeno, Richard Somiari, M.A. Aryan Namboodiri and Wayne B. Jonas, Potential Involvement of glass derived silicates in neuroprtection, *Homeopathy,* 2010, 99, 15-24.
11. Verplanck PL, Manning AH, Graves JT, McCleskey RB, **Todorov TI**, Lamothe PJ, Geochemistry of standard mine waste waters, Gunnison County, CO, July 2009, *USGS Open File Report,* 2010, OFR 2009-1292.

12. **Todorov TI**, Ejnik JW, Xu H, Squibb K, McDiarmid MA, Mullick FG, Centeno JA, Depleted uranium Analysis in whole blood samples, *Journal of Atomic Absorption Spectroscopy*, 2009, 24, 189-193.
13. van der Voet GB, Sarafanov A, **Todorov TI**, Centeno JA Jonas WB, Ives J, Mullick, FG, Clinical and Analytical Toxicology of dietary Supplements: a case study and review of the literature Biological trace element research, *Biological Trace Element Research*, 2008, 125, pp.1-12.
14. Sarafanov A, **Todorov TI**, Kajdacsy-Balla A, Gray MA, Macias V, Centeno JA, Analysis of trace elements in paraffin-embedded prostate tissue specimens using inductively coupled plasma mass-spectrometry, *Journal of Trace Elements in Medicine and Biology*, 2008, 22 (4), pp. 305-314.
15. Hageman PL, Plumlee GS, Martin DA, Hoefen TM, Adams M, Lamothe PJ, **Todorov T,** Anthony MW, Leachate Geochemical Results for Ash Samples from the June 2007 Angora Wildfire Near Lake Tahoe in Northern California, *USGS Open file report*, 2008, OFR2008-1170
16. van der Voet GB, **Todorov TI**, Centeno JA Jonas WB, Ives J, Mullick, FG, Metals and Health: a Clinical Toxicological Perspective on Tungsten and Review of the Literature *Military Mecidine*, 172 (9), 1002-5, 2007.
17. Chesnick I, **Todorov TI**, Centeno JA, Newbury DE, Small JA, Potter K, Manganese-enhanced Magnetic Resonance Microscopy of Mineralization, *Magnetic Resonance Imaging*, 25(7), 1095-1104, 2007.
18. Verplanck PL, Manning AH, Mast MA, Wanty RB, McCleskey RB, **Todorov T,** Adams M, Selected Water-Quality Data for the Standard Mine, Gunnison County, Colorado, 2006-2007, *USGS Open file report*, 2007, OFR 2007-1241.
19. **Todorov, TI**, Ejnik JW, Mullick, FG, Centeno JA, Chemical and Histological Assessment of Depleted Uranium in Tissues and Biological Fluids in *Depleted Uranium: Properties, Uses and Health Consequences*, Ed. Miller, AC, CRC Press, Chapter 6, 2006.
20. Mosley, C, **Todorov, TI**, Tseng, CH, Centeno, JA, Characterization of Arsenic Species by Raman Spectroscopy, *Metal Ions in Biology and Medicine*, 2006.
21. José A Centeno, Paul B Tchounwou, Anita K Patlolla, Florabel G Mullick, Linda Murakata, Elizabeth Meza, **Todor Todorov**, Herman Gibb, David Longfellow & Clement G Yedjou, Environmental pathology and health effects of arsenic poisoning: a critical review in *Managing Arsenic in the Environment*, Eds. Naidu, Ravi, et al, CSIRO Publishing, Australia, Chapter 17, 2006.
22. Christian JW, Hopenhayn C, Centeno JA, **Todorov TI**, Distribution of Urinary Selenium and Arsenic among Pregnant Women Exposed to Moderate Levels of Arsenic in Drinking water, *Environmental Research*, 2006, 100(1), 115-122.
23. Gray MA, Centeno JA, Slaney DP, Ejnik, JW, **Todorov TI**, Nacey, JN, Environmental Exposure to CD, Zn and Se and Risk of prostate Cancer, IJERPH, 2005, 2(3), 374-384.
24. **Todorov TI**, Ejnik JW, Mullick FG, Centeno JA, Arsenic Speciation in reference materials, *Microchimica Acta*, 2005, 151(3-4), 263-8.
25. Arun P, Moffet JR, Ives J, **Todorov TI**, Centeno JA et al, Rapid Sodium Cyanide Depletion in Cell Culture Media: Ougassing of HCN at Physiological pH, *Anal Biochem*. 2005 Apr 15;339(2):282-9.

26. Centeno JA, **Todorov TI**, et al, Histochemical and Microprobe Analysis in Medical Geology in *Essentials in Medical Geology*, Ed. Selinus O et al., Elsevier-Academic Press, Chapter 30, pp. 725-736, 2005.
27. Ejnik, J.W., **Todorov, T.I**., Mullick, F.G., Squibb, K., McDiarmid, M.A., Centeno, J.A., Uranium Speciation Analysis in Urine by Inductively Coupled Plasma Dynamic Reaction Cell Mass Spectrometry, *Anal Bioanal Chem*. 2005 May;382(1):73-9.
28. Yamaguchi, Y., **Todorov, T.I**., Morris, M.D., Larson, R.G., Distribution of single DNA molecule electrophoretic mobilities in semidilute and dilute hydroxyethylcellulose solutions *Electrophoresis*, 2004, 25, 999-1006.
29. **Todorov, T.I,** Yamaguchi, Y., Morris, M.D., Effect of urea on polymer buffer solution used for the electrophoretic separations of nucleic acids *Anal. Chem*., 2003, 75, 1837-1843.
30. **Todorov, T.I.,** Morris, M.D., Comparison of RNA, dsDNA and ssDNA behavior during capillary electrophoresis in semi-dilute polymer solutions *Electrophoresis*, 2002, 23, 1033-1044.
31. **Todorov, T.I.,** deCarmejane, O., Walter, N.G., Morris, M.D., Capillary electrophoresis of RNA in dilute and semi-dilute polymer solutions *Electrophoresis*, 2001, 2, 2442-2447.
32. de Carmejane, O., Yamaguchi, Y., **Todorov, T.I**., Morris, M.D., Three-dimensional observation of electrophoretic migration of dsDNA in semi-dilute hydroxyethyl cellulose solutions *Electrophoresis,* 2001, 22, 2433-2441.

PRESENTATIONS

43 presentations at national and international meetings.

FUNDING

2011-2013 – DoD Deployment Lung Health Grant (Co-PI)
2009/2010 – USGS Venture capital grant (Co-PI)
2008/2009 – USGS Venture capital grant (PI)
2008/2009 – USGS Venture capital grant (Co-PI)
2004/2005 – AFIP/ARP cooperative grants (Co-PI)
2003-2005 – Samueli Institute for Information Biology (CoPI)